



In the United States Patent and Trademark Office

Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

Appn. Number: 10/692202
Appn. Filed: 2003 Oct 23
Applicant: C. (Charles) David Rogers
Title: System and Apparatus for Automatic and Continuous Monitoring,
Proactive Warning and Control of One or More Independently Operated
Marine Vessels

Examiner/GAU: Gertrude Arthur/3661

Amendment B

Claims: Cancel all claims of record and substitute new claims 18 to 30 as follows:

18. An automated navigation assistance system for predictive analysis of time lapse and static meteorological, oceanographic and other forms of environmental and physical information that relate to conditions that threaten safe navigation and from this analysis provide proactive warnings and an advisory float plan that consists of headings to a safe location for one or a plurality of marine vessels operating within a defined navigable region comprising:

- a) A special purpose device for use on each marine vessel participating in the system; and said device may be implemented as portable, installed in a temporary mounting or configured as an integral part of another device and; except for a source of power is electrically independent of and separate in function from of all on-vessel operating systems and instrumentation and; is fitted with internal global position system (GPS) electronics used to provide vessel information (position, speed and heading) and; is further fitted with an operator keypad, indicator lights and an audible annunciator and; automatically transmits the GPS information and operator keyboard entries relating to on-board emergencies and National security, and server database inquiries by a

dedicated digital wireless communication link to a remote and dedicated on-shore fail-safe server;

- b) said server being adapted to routinely receive and store the vessel GPS information (position, speed and heading) as transmitted by a dedicated digital wireless communications link with the said device;
- c) said server being still further adapted to receive and store occasional operator keypad-entry data as transmitted by said communications link with the said device;
- d) said server being still further adapted to automatically acquire information from the Internet and other sources that define the future environmental state exterior to the immediate environment of said vessel or plurality of said vessels operating within said regions and; the general class of the information acquired from these sources include measured and modeled geophysical and other navigation-related information for the future environmental state of said vessels or plurality of said vessels and; the geophysical and other information include dynamic and static meteorological measurements as Doppler weather radar images, climate maps, weather buoy and weather station data, wind severity and sea turbulence mathematical models, oceanic and Inland waters information from digitized navigation charts including undersea topology and navigation aid locations, tide tables, current specification of hazards that are within the surrounding exterior environment of said vessels such as the location, heading and speed of nearby participating vessels and maritime ships, uncharted above and below water structural hazards other information relating to that normally causing said vessels an unanticipated serious accident while navigating within said region;

- e) said server being still further adapted to apply comprehensive and intelligent image analysis, pattern recognition, artificial intelligence and an ensemble of similarly complex application software algorithms as needed to analyze said information in order to identify magnitude, size, location, speed and heading of said threats to said vessels and use the results of this analysis as a basis for proactively warning one or a plurality of said marine vessels of said threats to the vessel and its occupants; and said threats include severe storms, high winds and seas, approach of participating vessels and maritime ships, above- and under- water obstructions, restricted areas and other determined threats within the path or heading of or are approaching said vessel or a plurality of said vessels;
- f) the server being still further adapted to use a classic feedback control algorithm to sequentially compare the stored said vessel GPS information, as the measured variable, individually with the position, speed and heading of dynamic said threatening conditions and position only of static said threatening conditions as the setpoint variable;
- g) the server being still further adapted to automatically compile and generate the parameters for concise alphanumeric and graphics display of proactive warnings and for enabling warning lights and audible alarms on said device as a first component of the supervisory control function of the said feedback control algorithm; and include as a parameter a request for said vessel operator acknowledgement by a said device digital wireless transmission to the said server in the event the server comparative analysis concludes there is one or more near future threatening conditions to occur to

- the said vessel or to said plurality of vessels and occupants and; these said conditions will occur typically within a time span of a fraction of a minute to a few hours in the future;
- h) the server being further adapted to automatically send these said parameters by means of said communications link with the said device located on said vessel or on a plurality of said vessels;
 - i) said server being still further adapted to automatically compute a proactive advisory as a second component of the supervisory control function of the said feedback control algorithm and; this said advisory is a float plan that comprises the optimum and safe float plan consisting of magnetic compass headings and/or waypoints to a safe location in order to remove or reduce the said threat to the said vessel or a plurality of said vessels;
 - j) said server being still further adapted to automatically prepare and transmit a packet of information that includes the proactive warning and safe heading advisory to a said vessel or plurality of said vessels;
 - k) said server being still further adapted to automatically prepare and transmit a packet of information that describes the nature of the threat to said vessel or plurality of said vessels and; automatically send this packet to either alert or summon the proper emergency-responder, Federal, State and local Government jurisdictions and nearby vessels;
 - l) the server being still further adapted to automatically compare the operator-entered keypad data for said on-vessel emergencies and National security with need to

either alert or summon the proper vessel service assistance including towing service, emergency-responders, Federal, State and local Government jurisdictions and nearby vessels and; automatically send this packet to either alert or summon said responders and nearby vessels if determined as necessary;

m) said device on said vessel or plurality of said vessels being adapted to receive the parameters and provide a clear and concise said display of the navigation-threatening conditions and to alert said vessel operators of the presence of the said displayed conditions by enabling the warning lights and audible alarm;

n) said device being adapted to receive and alphanumerically display, as a proactive advisory, the float plan consisting of said headings and/or waypoints to remove or reduce the threat to the said vessel or a plurality of said vessels and occupants.

o) The navigation assistance system of claim 18, wherein the defined navigable regions of operation include coastal, Inland lakes, waterways and other navigable waters.

19. The navigation assistance system of claim 18, wherein the said device is further adapted to allow the operator to exercise the option of interfacing and downloading the said safe float plan consisting of magnetic compass course headings and/or waypoints to a vessel system that applies control of the vessel helm or rudder; and these are the proactive advisory float plan that consists of safe magnetic compass course headings and/or waypoints designated as the as a second component of the supervisory control function from the classic feedback control algorithm.

20. The navigation assistance system of claim 18, wherein the GPS information (position, speed and heading) available within the said device electronic circuitry is routinely collected and

transmitted by means of digital wireless communications for analysis by the remote or shore-based fail-safe server.

21. The navigation assistance system of claim 18, wherein the said device further comprises an interactive operator interface means for mariner-initiated communication with the server.

22. The navigation assistance system of claim 18, further comprising external communication means for initiating automatic contact between the remote or shore-based fail-safe server with a second party.

23. The navigation assistance system of claim 18, wherein the special purpose device further includes one or a plurality of ports for optionally interfacing downloaded float plan consisting of said headings and/or waypoints to other on-vessel electronic devices and instrumentation such as navigation chart plotters and laptop computers.

24. A method of ensuring marine vessel and occupant safety comprising:

- a) routine automatic monitoring of relevant data concerning participating marine vessels;
- b) comparing said relevant data to a before-the-fact (apriori, predictive) analysis of time lapse and static meteorological, oceanographic and other forms of environmental and physical conditions to determine whether threats to the said vessels and their occupants exist; and
- c) automatically and proactively notifying a specific or a group of said marine vessels of said conditions that are a threat to vessel navigation and safety of the vessel and its occupants.

25. The method set forth in claim 24 wherein the relevant data comprises the GPS information (position, speed and heading).

26. The method set forth in claim 24 further comprising the transmittal of advisory safe course information that an threatened vessel operator may optionally elect to interface from the special purpose device port to automatically steer said vessel.
27. The method set forth in claim 24, further comprising capability to automatically respond to queries of the ORACLE database resident in the fail-safe server as initiated by said vessel operator.
28. The method set forth in claim 24, further comprising automatic response to the database queries initiated by said vessel operator.
29. The method set forth in claim 24, further comprising handing off data about a participating vessel from a first remote or shore-based fail-safe server to a second remote or shore-based automated navigation assistance and proactive warning system fail-safe server.
30. An automated navigation assistance system for one or a plurality of marine vessels comprising:
 - a) a dedicated special purpose device in each marine vessel for providing its internal GPS information (position, speed and heading) and operator keypad-entered data and transmit said data to a remote fail-safe server; said device being further adapted to provide the vessel operator with the option to apply received proactive advisory float plan consisting of magnetic compass headings and/or waypoints to automatically operate the vessel helm or rudder the vessel; and still further comprising one or a plurality of ports for optional data downloads of said magnetic course headings and/or waypoints to other electronic devices for display;

- b) said fail-safe server being adapted to receive and store GPS information (position, speed and heading), operator keypad-entered data and still further adapted to cooperatively communicate with one or a plurality of separate navigation assistance systems;
- c) said server being still further adapted to continuously apply GPS information (position, speed and heading), operator keypad-entered emergency data received from said device to generate a hard-copy report of contact at the said server location in the event any warning has been transmitted to a participating vessel.
- d) said server being still further adapted to communicate with an nearby monitoring computer integral with the server system architecture; and said computer is interfaced with the server for purposes of manually accessing, updating, monitoring and displaying all relevant information in the ORACLE database by system administration and primary on-shore host location personnel.
- e) said server being still further adapted to store a complete audit trail or history in the ORACLE database comprising of all information during and subsequent to threatening incidents and potential accidents and security breaches (as entered by means of the operator keypad) and other incidents in the ORACLE database for purposes of analysis by accident investigators, Homeland Security and other jurisdictions.